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SECURITIZED ASSETS -- CASH FLOW TRAITS

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Securitization of assets means that future cash flow is divided into tranches. These tranches are then sold to insurance companies and pension funds. This panel discussion will cover the cash flow traits of:

- Collateralized mortgage obligations
- Collateralized bond obligations
- Asset backed securities
  - Automobile loans
  - Credit cards
  - Receivables

MR. MICHEL PERREAULT: We've got two outside panelists to discuss investments. Our first panelist is Dave Woolford, who has been with Prudential for the last five years. Dave has a number of portfolio managers reporting to him, who, together, manage approximately $50 billion of interest-sensitive assets. He'll be discussing the motives behind the market for the issuers, which will lead into Peter Minton's presentation.

Peter recently joined Morgan Stanley. He'll be working on developing securities packages for backing up specific insurance liabilities. Prior to his current position, he spent six years with C&B Investment Counselors in Los Angeles. There he managed all the mortgage-backed instruments and collateralized mortgage obligations (CMOs).

I've realized in the last few years that the degree of sophistication on the asset side has far outpaced the new things that we might be doing on the liability side. As one who's responsible for modeling cash flows, it's becoming increasingly difficult to keep pace with what is going on, on the asset side. So hopefully this session will give us some good insights on those challenges we're facing.

MR. WILLIAM D. WOOLFORD: A little historical perspective on this topic may be useful.

Legions of actuaries have been educated in the nuances of marine underwriting and nonrecourse lending. Lloyds underwriting syndicates have created securitized transactions for centuries. The mere fact of underwriting a cargo gives the shipowner

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a nonrecourse means to finance his activities. The premium paid reflected expectations of his economic motives based on the equity he had committed.

Life actuaries are equally familiar with securitized transactions. The traditional whole life business, initially one centered on the economic value to be attached to loss of an income stream, with death taken to be the ultimate disability, became, with the concept of nonforfeiture, very much a securitized transaction. The individual policyholder can, if he is healthy, surrender his policy for cash or, if he can't be insured elsewhere, borrow some semblance of its value. Computation of the premium requires a kind of reverse mortgage -- the annuity -- but simplifies the previously messy problem of exercise of the disintermediation option.

From my standpoint, the insurance and finance markets tend to display parallel exploitation of economic theories, with the actuarial markets a little earlier or quicker, historically. While one might be tempted to lay this to stronger academic interests, my own belief is that it reflects the actuary's close connection with the profitability of his business. As an example, the interest sensitivity of a cash flow was clearly demonstrated by Hicks, at Oxford, and Samuelson, at Harvard, in the interwar era; Redington's 1952 article brought the topic to the attention of the actuarial world, and Fisher and Lorie, almost 20 years later, illustrated the same applications for assets.

In my opinion, finance has recently shown a faster rate of evolution. The driving force has been economic. In 1981, record interest rate levels created demand for stripped Treasury securities that were met by literally clipping future coupons and the corpus (principal) from physical Treasury securities. The first issues -- Certificates of Accrual on Treasury Securities (CATS), Treasury Investment Growth Receipts (TIGRs), Certificates on U.S. Government Receipts (COUGARS) and other creative CAT variants -- found such interest that the sum of the offering prices was as much as four points higher than the price of the underlying security. On $1 billion, that is $40 million -- more than enough to invest in a few financial engineers and specialized marketing personnel.

Compare that with the current environment. Chart 1 shows the average differential in basis points for the three months ending February 1991, between the theoretical spot curve and the separate trading of registered interest and principal of securities (STRIPS). While the differential at the seven-year point is comparatively large, if we took the STRIP curve and used it to create the current seven-year note, the pricing error yesterday was about two basis points -- three ticks. This has become an extremely competitive market.

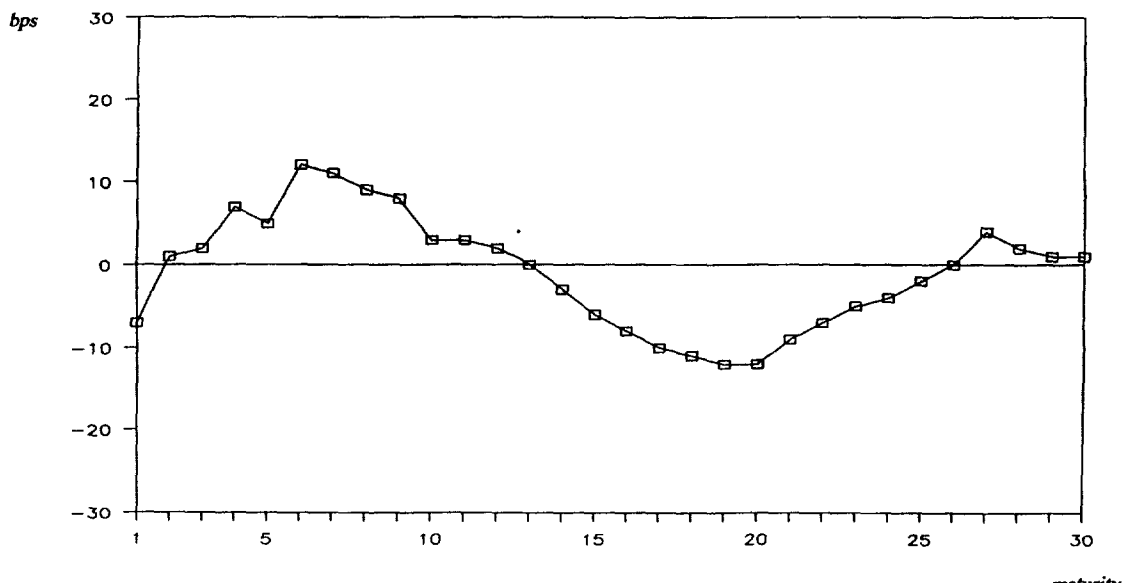
After competition and the presence of personal computers inevitably shrunk margins to competitive levels, Salomon and First Boston took a strangle hold on the CMO business. You will search in vain -- appropriately, I think -- for any evidence that this was motivated by any deep-rooted interest in spot or forward curves, in concavity properties of mortgage prepayment models, or in nested American options. The profit motive, pure and simple, was at work.

For both Treasuries and CMOs there was -- and is -- no scarcity of raw material. Competition bid up the price of the complementary resource, financial engineers, who were temporarily in scarce supply, to prices that even actuaries found attractive.

CHART 1

STRIPS SPREADS TO THEORETICAL SPOT RATES

AVERAGE DIFFERENTIAL
SEPTEMBER 26, 1990 TO MARCH 26, 1991



Some crossovers occurred, but the cheaper and more readily available raw material was economists, for whom demand surged.

The remainder of the last decade has largely been a race for temporary market dominance and variations on the core model of a stripped security. Without becoming overly specific -- I'll leave descriptions of some of these specific instruments to Peter and to later panels – let me cite the following genealogy.

Initial "engineering" focused on manipulating cash flows to match buyer demand but create a residual that could either be easily hedged or acquired at roughly a zero basis. Securities thought to be default free formed the nucleus. While both issuers and Wall Street engineers talked about stripping corporate securities, the lack of a claim in bankruptcy for the coupons limited stripped corporates to de novo zero coupons, and the lack of ability to create a credit and sector diversity in a portfolio ended even these attempts.

Not so in CMOs. Although only Government National Mortgage Association (GNMA) securities have a government guarantee, Federal National Mortgage Association (FNMA) and Federal Home Loan Mortgage Corporation (FHLMC) pass throughs quickly gained general acceptance. The reason was largely supply. GNMA supply, which is limited to moderately priced housing and small mortgages, has strict pool requirements. FNMA and FHLMC were both more aggressive in raising the maximum mortgage size and were willing to work with a number of builders and mortgage bankers to prepackage securities for CMOs and offered more flexible pool requirements.

Initially, payment schedules were sequential: one tranche had to be fully paid before a second tranche initiated. However, competition soon pushed engineering to offer several tranches simultaneously capturing prepayments according to a prespecified formula. Support tranches, where one or more tranches receive any excess whenever a specified (or preference) tranche reaches a maximum payment for a period or over some cumulative interval, were available by 1983. The first Planned Amortization Class (PAC), in which several "companion" tranches act to absorb cash flow variability and make it highly probable that the PAC will have a defined sinking fund schedule, arrived in 1985. Stripped mortgage-backed securities (MBS) were first offered in 1986.

As an illustration, Chart 2 describes a security offered four years ago by Merrill Lynch. The nominal issuer was a now defunct New Jersey thrift, City Federal Savings. The security was priced on October 29, 1987, for settlement on December 1. Interest on the CMOs is payable with no lag versus the FNMA 11% collateral; the collateral in turn carries coupons ranging from 11.4-13.4%. Note this fact. Prepayment projections must incorporate both the age and coupon distribution of the collateral, not the coupon on the pass through.

This CMO was created partly to give City Federal a bullish residual, but mainly to generate an investment banking fee for Merrill Lynch. The form of the CMOs -- sequential pay fixed-rate tranches supporting a floater -- was selected both because the floater offers the best opportunity to maximize the potential payoff to the residual holder -- the issuer, City Fed in this case -- from a drop in interest rates, and (at least

CHART 2

BULLISH RESIDUAL

City Fed Mortgage Trust Series 1987 - 1 (CIFED1)

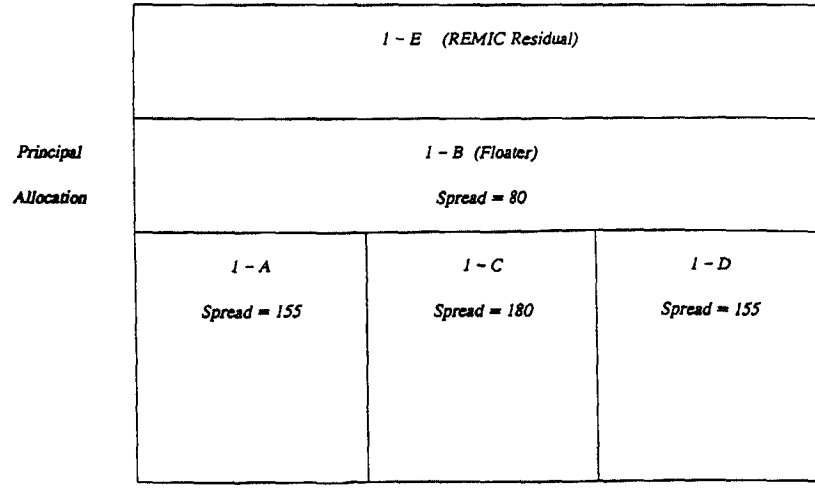
Collateral:	*100% FNMA*
Net WAC:	*11.0 (11.0-11.0)*
Gross WAC:	*11.7 (11.4-13.4)*
WAM:	*25.0 years*
Payment Frequency:	*Monthly*
Next Payment Date:	*04/01/90*
REMIC Status:	*REMIC*
Rating (MDY/S&P/FITCH)	*NR/AAA/NR*

DEAL STRUCTURE

Tranche	*Type*	*Original Amount*	*Current Amount **	*Coupon*	*Stated Maturity*
A	*Normal*	*$55,595,000*	*$23,624,000*	*9.20%*	*06/01/15*
B	*Floater*	*42,685,000*	*23,868,000*	*9.18%*	*01/10/18*
C	*Normal*	*16,220,000*	*16,220,000*	*9.75%*	*02/01/17*
D	*Normal*	*9,245,000*	*9,245,000*	*10.00%*	*01/01/18*
E	*REMIC Residual*	*1,255,000*	*1,255,000*	*0.00%*	*01/01/18*
		$125,000,000	*$74,212,000*		

** MARCH 1, 1991*

CITY FED MORTGAGE TRUST SERIES 1987 - 1 (CIFED1)



equally important) to meet the market demand for high spread, low credit risk securities that emerged just after that 508-point drop in the Dow industrials. The going-in spreads at pricing – 180 basis points over the 10-year Treasury (C tranche) and 155 basis points over the 20-year (D tranche) – meet this criterion. By sharing in the prepayment stream, the floater helps to lengthen the maturity of the fixed pay securities, bringing them more in line with buyer (insurance companies) appetites at that time.

Had the marketplace anticipated rising rates, the structure would have replaced the fixed tranche with several PAC tranches. Such a design reduced the risk of lengthening in maturity as prepayments slowed with the rise in rates. The PAC tranches would have carried significantly lower spreads to comparable Treasuries at pricing; this would be used to buy protection against early amortization of the PAC through one or more support tranches – so-called "companion bonds" – whose share of prepayments varies with the prepayment rate. For willingness to accept cash flow and total return volatility, the companion bondholder receives a higher standstill yield. An example would be the Goldman, Sachs GS Trust 5 Series A (Chart 3), containing two standard tranches, two accrual bonds to "soak up" cash flow volatility, and a floater tranche. In this structure, the accrual bonds and the floater take on most of the cash flow risk, with one accrual bond able to take on average lives ranging from 2 to nearly 20 years!

Like the City Federal deal, the GS Series 5 had a residual. For City Federal, this residual offered a levered bet on interest rates. The residual receives all surplus interest off the collateral after payment of fees, expenses, and interest on the first four tranches. The lower the level of short-term rates, on which payments on the floater are based, the higher the residual income stream. The lower the projections for prepayments, the longer the residual can be expected to earn these high returns.

This payoff matrix (Table 1) was constructed under market conditions existing a year ago: if interest rates dropped as the economy dipped into recession and prepayments slumped, the residual would be a big winner.

TABLE 1
Internal Rate of Return
Priced to yield: 16% standstill
(Modified duration in parentheses)
Analysis as of March 29, 1990

	LIBOR				
PSA	−4	−2	0	+2	+4
110	56 (1.6)	41 (2.1)	26 (2.9)	13 (4.9)	3 (11.6)
150	53 (1.6)	38 (2.1)	24 (3.0)	11 (5.1)	2 (11.8)
275	42 (1.6)	28 (2.2)	16 (3.3)	7 (6.1)	1 (11.6)
385	33 (1.7)	21 (2.4)	11 (3.8)	4 (6.5)	−0 (10.2)
465	27 (1.8)	16 (2.6)	8 (4.1)	3 (6.4)	−1

Source: Reprinted with permission from First Boston Research, New York, New York.

CHART 3

Summary of Terms

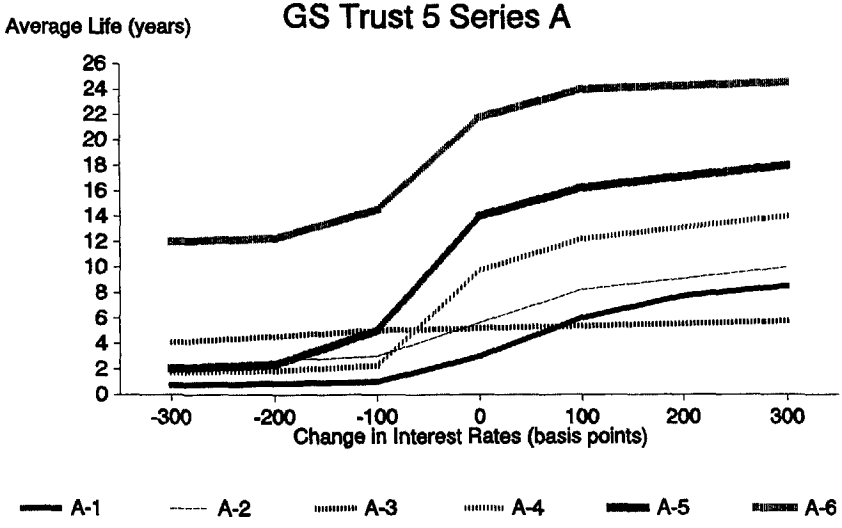
GS Trust 5 Series A

Tranche	Original Balance ($MM)	Coupon	Stated Maturity	Expected Average Life
A-1	28.650	9.0%	06/07/08	3.3 yr.
A-2 (Floating Rate Bond)	71.250	LIBOR + 85	01/07/15	7.1 yr.
A-3 (PAC Bond)	35.625	9.0%	01/07/15	5.8 yr.
A-4	5.625	9.0%	03/07/09	10.9 yr.
A-5 (Accrual Bond)	5.850	9.0%	01/07/15	14.9 yr.
A-6 (Accrual Bond)	3.000	9.0%	12/07/16	22.5 yr.

Collateral: GNMA 11s

Average Life Sensitivity

GS Trust 5 Series A



Note the short time horizon over which correct forecasts will be rewarded, and the long workout period for guessing wrong. We can use the following linear approximation for realized compound yield to compare the two results:

$$RR = Dur/H \times TR + (1 - Dur/H) \times RIR$$

Here, RR stands for realized return, TR for the total return on the residual, and RIR for the reinvestment or borrowing rate.

For the bullish scenario, and a five-year horizon, a value of as much as $38 \times 2/5 + (1 - 2/5) \times 6$, or about 12%, would not be unlikely; in the bearish case, values of $7 \times 6/5 + (1 - 6/5) \times -10$, or about -3%, would not be unlikely. Actually, those are both pretty good. Residual cash flows are among the most unpredictable of the CMO universe; for this reason, and the possibility of negative return of principal, their expected returns should compare favorably with high-yield securities. Like high-yield securities, they were profitable investments of many thrifts.

This example did not contain a principal only or stripped CMO. Flexibility in pooling requirements offered by FNMA and FHLMC proved particularly important when stripped MBS appeared. Initially, as with CMOs, strips were only offered backed by GNMA collateral to preserve the coupon's credit support, but this was quickly followed by FNMA and FHLMC stripped coupon securities.

With zeroes, financial engineers could give free rein to their imagination. The price of the principal only (PO), which is entitled to all of the payments, whether scheduled or prepayments, plus the price of the interest only (IO), which receives only the interest payments, must equal the price of the underlying collateral plus perhaps a competitive engineering charge. This means that independent of future movements in interest rates, the price of a PO stripped from 11% collateral will (almost inevitably) sell at a higher percent of par than a PO stripped from 10% collateral, because prepayments can be expected to be higher for the former, even though scheduled payments accumulate more slowly.

The reverse is NOT true for an IO. For a given level of interest rates, the price of an IO based on 11% collateral will be lower than the price of an IO based on 10% collateral because of slower prepayments projected for the latter security. At high enough interest rates, the price of the 11% IO will rise to exceed the 10% IO. With low enough prepayments, the higher interest component of the cash flow stream more than offsets a small differential in prepayments.

POs are convex securities with respect to prepayments. A little of this dynamite goes a long way. Table 2 shows how a 1% permanent change in prepayment changes the yield on a FNMA PO stripped from 30-year 10% collateral by about 60 basis points.

With stripped MBS, any combination of prepayment expectations is possible. Because of their volatility, rather than in spite of it, PO strips have been particularly useful to Wall Street for hedging CMOs. In hedging this activity, the underwriter wants to avoid losses from volatility. The underwriter goes long a PO position, Treasury futures and options, while accumulating the necessary mortgage collateral in

the forward market to meet the short created by the CMO transaction. (This hedging activity may tend to make IOs cheap on a fundamental basis, and it should be noted that they have ready-made competition from mortgage servicing rights, which act like an IO.) The alternative would be to accumulate the collateral prior to marketing the CMO: this requires taking basis risk or seeking the collateral aggressively at the time that the CMO is offered: this can be difficult because the market actively follows the collateral described in the CMO.

TABLE 2
The Effect of Different Prepayment Speeds
on Cash Flow Yields of IOs, POs, and Unstripped MBSs
Collateral: FNMA 10%

CPR %	IO	PO	MBS
6%	19.35%	4.61%	9.74%
8	17.10	5.63	9.69
10	14.82	6.73	9.63
12	12.51	7.90	9.58
15	9.00	9.77	9.49
20	3.00	13.11	9.33
25	-3.19	16.70	9.17
30	-9.61	20.54	9.00
40	-23.18	29.02	8.63
50	-37.98	39.12	8.20
Price	$38.34	$63.66	$102.00

Source: Morgan Stanley

How will an investment in CMOs perform? Last year's purchase of the City Fed residual would have produced a total return over the past 12 months of 35-40%.

My personal bias is that very little has been done in the way of postinvestment audit of returns, however. When you get home, ask! Insurers carry their CMO investments at book for the most part and largely ignore the issue of how to create a meaningful bogey for total returns. Perhaps not surprisingly, Wall Street has very little to say on the subject.

What I'm about to show you would hardly constitute seminal work (although if uncertainty as to how to make the computations is any indication, there may be no counterparts).

Between August 1988 and December 1989, Prudential and First Boston conducted a joint experiment -- joint in the sense that it involved Prudential's assets and First Boston's intellectual and trading resources. The test involved creation of a portfolio initially consisting of $250 million of Treasuries. Think of these as surrogates for annuities. Over the next several months, the Treasuries were traded to a portfolio of CMOs whose expected spread over Treasuries averaged in excess of 125 basis points.

Both First Boston and Prudential corroborated extensively in security selection and hedge design – futures, options, POs – with the goal being to show an ability at some future point to buy back the initial Treasury portfolio and have money left. Security selection criteria meant that hopefully the portfolio had a better opportunity to show an improved performance than a market bogey; trade reversals were encouraged where they generated meaningful profits or were appropriate to rebalance the portfolio's duration, volatility, or yield curve exposure. The experiment permitted borrowing (leverage) of up to 20% of the value of the portfolio to facilitate hedge and trade execution, to deal with differential settlement, etc.

Each cash flow and all synthetics – long and short – were tracked. Performance against the Treasury benchmark was computed, but so was performance against a more meaningful bogey, the underlying collateral. During this period, mortgage securities widened against Treasuries: not surprisingly, the higher projected cash flow on the CMO portfolio was unable to counteract the widening in the basis over such a short horizon. Some portfolio holdings did outperform the collateral – in one case, by more than 50 basis points. However, one large loss, as you can see from Chart 4, pushed the portfolio's comparative performance into negative territory.

To be consummated, a securitized transaction must have the characteristic that the sum of the parts is worth more than the collateral at pricing, immediately drops to less than the collateral value at issue, and can never be worth more than the collateral – because of its lack of liquidity. In fact, securitized transactions enhance the value of the collateral by providing additional sources of demand. Also, there is not much incentive to build a security that would serve a smart buyer. A CMO must have at least two pieces. If one is cheap, the other must be rich. The smart buyer buys the cheap piece, the rich piece is sold to . . . you figure it out.

I'm going to come back to some of these issues with suggestions that I'll have. What I'll do now is turn this over to Peter who will carry you through specific things to look for in these types of securities.

MR. PETER A. MINTON: What I'd like to do is walk you through some basics of securitized assets, a *Readers Digest*-type version of how to project cash flows off of these assets: what they're dependent on or what people feel that their dependency is on for generating cash flows from these issues.

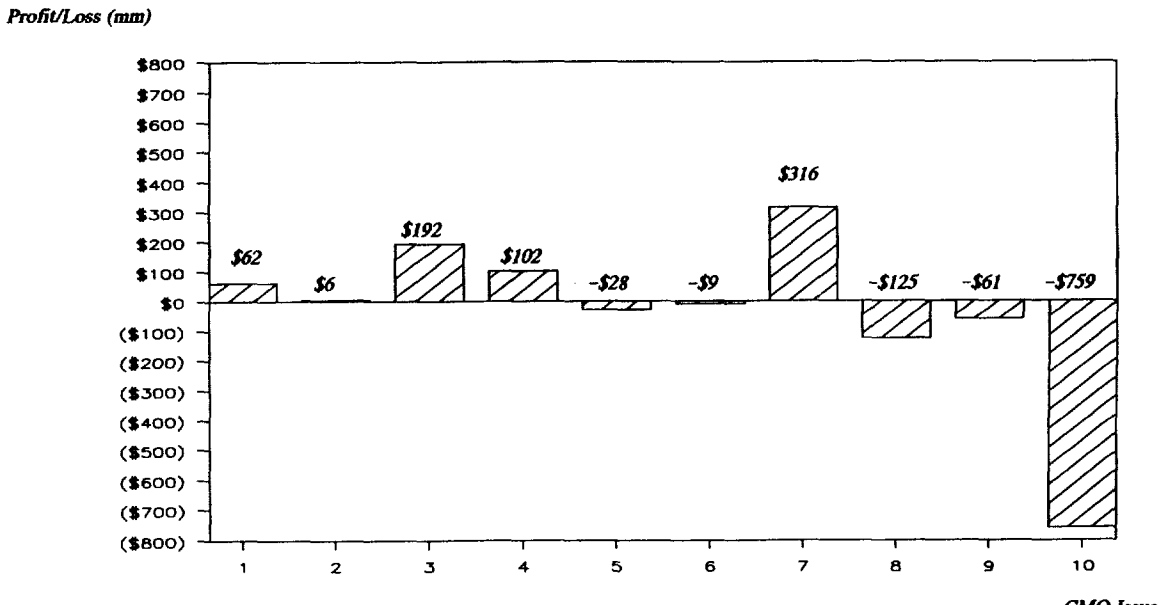
When CMOs were originated, they were Wall Street's attempt to create an MBS with greater cash flow and average life certainty. The stability was achieved by carving out the cash flows from the underlying mortgages into various different tranches. In the early years it was usually three or four tranches of cash flows, each with different average lives. The original securities were traditionally sequentially paying. The first tranche would need to be paid off before the second tranche began to pay down.

This engineering was found to not achieve as much cash flow certainty as they had hoped. Certain tranches became very short tranches because prepayment speeds kicked up. The reverse was true in other cases where the CMOs paid much slower than priced. Therefore the cash flows did not return as quickly as was expected.

CHART 4

SUMMARY OF RETURNS FOR CMO's
(PROFIT / (LOSS) VERSUS BOGEY)

(ASSUMING 8.875% REPO RATE OR BORROWING COST)



Because of these problems PACs and Targeted Amortization Classes (TACs) were created. PACs and TACs are similar sorts of animals. PACs generally are designed such that they reduce the prepayment risk within an upper or lower band of prepayments. For example, the average life of a FNMA 1991-33B, the B being the second tranche of that CMO, will be 3.4 years as long as the prepayment speeds on the underlying collateral remain within 90 and 185 PSA.

As long as prepayment speeds remain within those bands, there is stability to the cash flows and the average life of this issue. Any violation of those bands will affect the average life and the cash flows of that security. How greatly you violate the bands, and which tranche of the CMO your PAC is, will determine to what extent.

Let's take an example of a tranche where there are three or four PAC classes supported by companion pieces. If you have prepayments speed up, the excess cash flows that should not go to the PACs are paid to the companion pieces. If those companion pieces are small in relation to the PACs in the CMO itself (or you're in one of the later PACs), and early prepayments have eaten up most of that companion bond, then you have a greater risk of a violation of those prepayment speeds.

TACs are similar to PACs. TACs, however, are generally protected on only one side. As an example of that I'll use the FNMA 1990-62Ds where, with prepayment speeds being 155 PSA or longer, the average life in the cash flows is stable. If the prepayment speeds drop below that 155 level, then that TAC is not protected from a lengthening, but is protected from a shortening. By buying a TAC, what you've achieved is within the bounds that we discussed on PACs. You have a large amount of certainty as to the average life stability for prepayment speeds that would generate shortening of that asset, but not lengthening. You've got a one-sided protection.

The PACs and the TACs are generally the targeted pieces of a CMO. Companion, or support, pieces were created to protect the PACs and the TACs. Those companion pieces come in many different forms. We've listed some here, which include PO classes, IO classes, and Z tranches. Z tranches have been around since the inception of CMOs, even without PACs and TACs.

Z tranches, instead of paying current interest, accrue interest in the form of more bonds. They're akin to a pick bond, only rather than the factor declining through time, it increases over time until that tranche begins to pay down. It pays down from a factor that is greater than one. You're getting a monthly flow, but not cash flow. You're getting an accrual flow.

Floating rate CMOs and inverse floating rate CMOs are exactly what they sound like. They are CMOs which do come in PAC flavors, but are mostly non-PAC and are companion pieces. Inverse floaters are the same. They are there to support, for the most part, the PACs and TACs. The final pieces are residuals, which get cash flows if there are flows remaining longer than the time expected.

What's going to help to determine the underlying prepayments of the CMOs? The first thing to understand obviously is that what underlies these CMOs are mortgages. Whether they're GNMAs, FNMAs, FHLMCs, whole loans, whatever they might be, they are mortgages. And therefore, before we can determine the cash flow on the

CMO, we need to determine the cash flows on the underlying mortgages. That's a fairly strong statement given that there's no way of actually knowing what the prepayments are going to be. It's still an art rather than a science. But there are four traditional factors which help us determine, within bands, what prepayment speeds might be on the underlying collateral.

1. Interest rate differential (Chart 5) is simply the difference between the related average coupon of the underlying collateral and current mortgage rates. One thing to stress again is that what you need to be measuring is not the coupon that's being passed through to you as the investor, but the coupons on the mortgages that underlie this.

   In Dave's example we had an 11% pass-through rate on the mortgages, but the collateral had 11.5% mortgages underlying it.

   Therefore, if you're looking for interest rate differential, you're going to go from the 11.5 rather than the 11 because that is what the mortgage payor is having to pay. He's not going to decide whether to prepay or refinance his mortgage based on what you're getting as a coupon flow. He's going to do it based on what he's paying to his bank.

2. Seasoning (Chart 6) is the time period that the loans have been outstanding. PSA has looked at prepayment speeds on the average mortgage, and how much time it takes before it's fully seasoned.

   This concept reflects that in the first few months of a mortgage, refinancing is rarer. People are less likely to move or relocate, some of the traditional causes of prepayments. Therefore, there is a grace period, where the events that traditionally trigger prepayments simply are just less likely to occur.

3. Seasonality (Chart 7) means that home sales show a seasonal pattern. Home sales are one of the things that trigger prepayments.

4. Burnout (Chart 6) is a factor that says as time increases, people who have not prepaid will be less likely to do so. This is similar to a single premium deferred annuity (SPDA) product, where you've got surrenders that are considered to be interest sensitive. There are people, however, who simply will not surrender, no matter how much you beat them over the head.

   There are a few factors that aren't modeled traditionally, but are worth looking at. The primary one is the economy. The economy is difficult to model, and that is why it usually isn't. But it certainly has an effect. Any modeling of prepayment rates has been generated in periods that are not necessarily representative of the current environment. We've seen environments where (1) the economy is doing well and rates are rising, (2) the economy is doing well and rates are falling, and (3) the economy is doing poorly and rates are rising. But the cycle that we're going into now has not occurred for a sufficient length of time to enable us to really test what's gone into these modeling characteristics.

CHART 5

Driving Forces in Mortgage Prepayments

Interest Differential

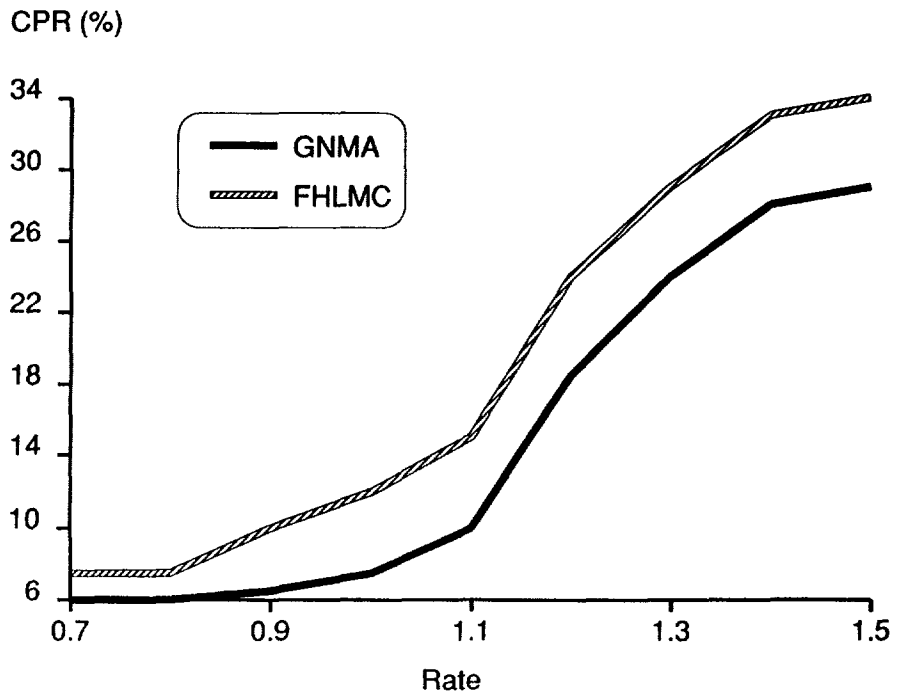


CHART 6

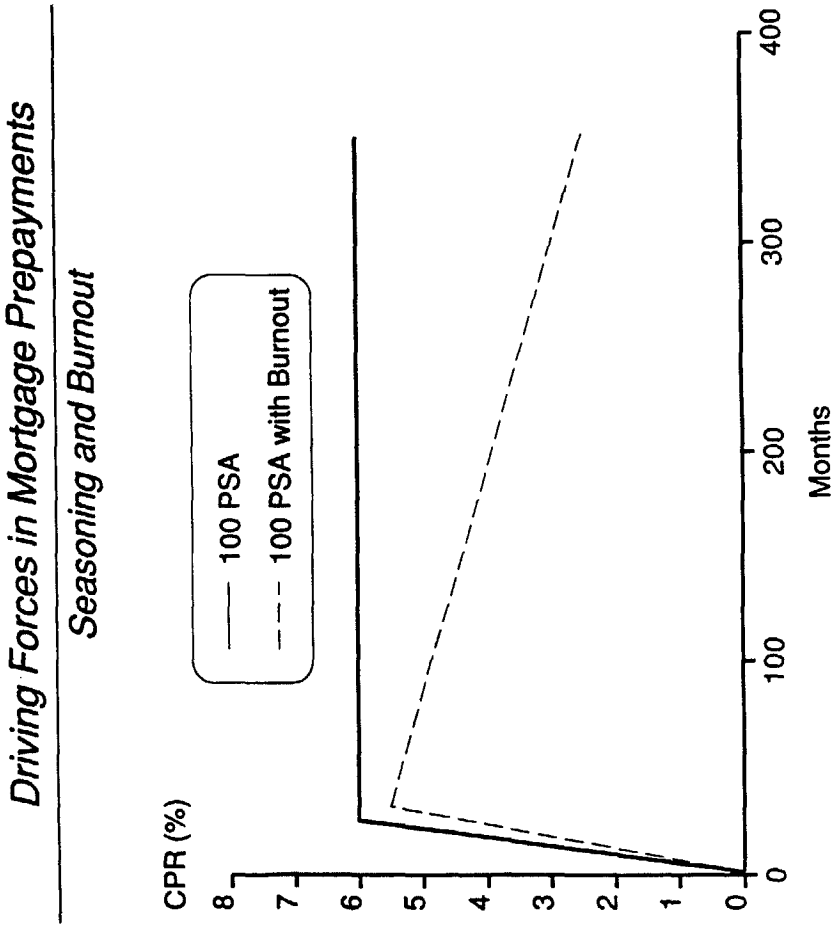
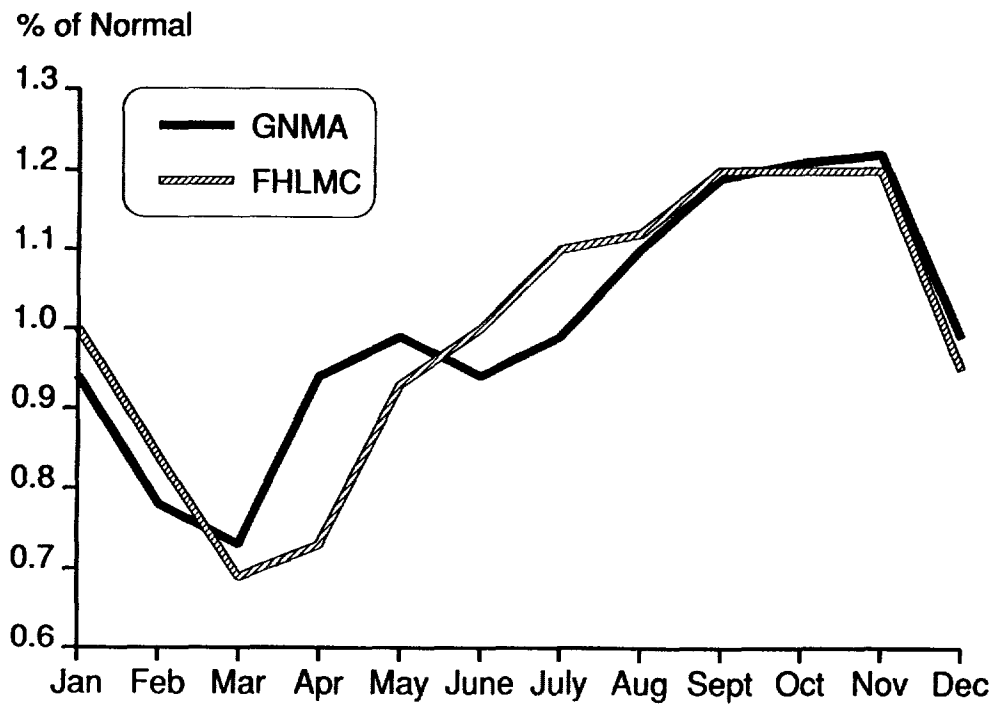

Driving Forces in Mortgage Prepayments
Seasoning and Burnout
CPR (%)
8
7
6
5
4
3
2
1
0
100 PSA
100 PSA with Burnout
0
100
200
300
400
Months

CHART 7

Driving Forces in Mortgage Prepayments

Seasonality



So the economy is a factor, and it tends to negate the effect of rates. If the economy is weakening, prepayments will tend to slow down. If the economy is booming, they will tend to increase. That is partially a locking-in effect from the Loan to Value (LTV) ratios. If housing prices are declining or the economy is slow, there's simply not as much mobility.

The other factor that falls into the not-modeled characteristics is geographics. There are tendencies for regions of the country to be in different economic cycles, different home value cycles, and even different interest rate cycles. Geography, therefore, has an effect.

Finally, the other thing that we need to model in CMOs is the structure of the CMO itself. The CMO is taking the underlying collateral and dividing it into who has the right to the cash flows off these mortgages. You've got a division of cash flow that is unclear, particularly in the more esoteric instruments. To generate the cash flow on any one tranche of the CMO, you must understand and model the characteristics of that CMO itself, because its structure will have a very big impact on whether your tranche gets paid.

The other thing you can't overlook is the need to generate scenarios of interest rates. That comes back to an appropriate interest rate scenario generator, which I will not address now. Clearly, however, if the driving force is an interest rate differential, you're going to need to model either what you believe the rate environment will be or a more real world scenario generated from past interest rates.

Let's get into each of these driving forces a little bit more.

1. Interest Differential -- There are two primary forces that model the prepayment speeds: either the ratio of the underlying coupon of the collateral to current mortgage rates or the difference between the two. (Chart 5 is a chart of the ratio.) As the coupon gets larger in relation to what a person can refinance at, the propensity to prepay or refinance is greater.

   It does flatten out, both on the top and the bottom (Chart 5). There seems to be a noninterest sensitive portion of prepayments. The portion depends on whether you're in GNMAs or FHLMCs. In all of these charts, FHLMCs pertain to FNMAs and vice versa.

   The curve is very sensitive once you get above 1.1 times the underlying coupon. One of the reasons I like ratio better than difference is that prepayments speeds are sensitive to the absolute rates as well as the spread, and the ratios capture that better.

2. Burn Out – Generally the PSA assumes a 30-month wrap-up period, with 100 PSA equivalent to six Constant Prepayment Rates (CPRs). The CPR is what percentage of the mortgages each year will prepay.

   The PSA basically says that, over a 30-month period, you're going to wrap up ratably to that 6%. In the first month, you're going to have 1/30 of 6%, increasing each month until you reach the full 6%.

The burnout factor is modeled below it as the dashed line (Chart 6). Burnout, again, simply says that as people prepay, those that remain are less likely to refinance.

3. Seasonality -- Housing turnover is seasonal. Chart 8 shows single family housing turnover, nonseasonally adjusted. You can see that January and December of each year are low points, and the summer months are high points. Obviously, if turnover of housing is a refinancing event, that's going to be a clear driver of refinancing.

By combining these factors, you get a multiplicative effect. In that fashion we can model speeds by starting with what the interest rate differential gives us, rate differential being the primary factor. We then adjust versus normal for these other factors by either adding or subtracting some percentage of the expected rates.

How well have these projections tracked reality? See Chart 9. The solid line is the actual historic CPRs and the dotted and dashed lines are projected CPRs. There were a couple of periods where they miss, but they track fairly well for the most part. Fairly well is probably good enough for basic CMO tranches and basic mortgages. For IOs and POs, however, fairly well is not as good as you would like. But, this paints a pretty good picture over the long run of expected prepayment rates.

Now let me show you one of the worst matches that I could find -- GNMA 9s, historic versus projected (Chart 10). It has not been a terrific projector of prepayment speeds on that issue. I would emphasize that more of the graphs look like the better fitting than the worse fitting.

The next refinement is to look at 12-month moving averages. You still get periods of divergence, but you are pretty closely matched for most of the time period. For fairly generic mortgages and CMOs, if you're willing to do a buy and a hold strategy, that's a pretty good indication. If you're dealing with IOs and POs, or you're looking at a very short time frame, then you're going to have to make your best guess and work with that.

Let's go on to some other asset-backed securities. The asset-backed security market consists primarily of three types of instruments: credit card loans, auto loans, and home equity loans. Collateralized bond obligations (CBOs) are probably considered asset-backed securities but are a bit of a different animal, so we'll address them separately. Home equity loans, because of their nature, are prohibited transactions in some states. I won't take the time to go through those.

Credit card loans are issued with an interest-only period and controlled amortization periods. Controlled amortization periods take the form of monthly planned prepayments to a final payoff of the card loan. Some come with soft or hard bullet repayments. Hard bullet repayments are simply that somebody has agreed to buy back all remaining or outstanding balances on those card loans, so there is a hard maturity. That form of card loans is the closest thing to a corporate security that there is in asset-backed securities. Soft bullet repayments are where you are at risk that the paybacks on the credit cards will take longer than the planned maturity. Even the soft bullet repayments have been relatively stable. They have not been very

CHART 8

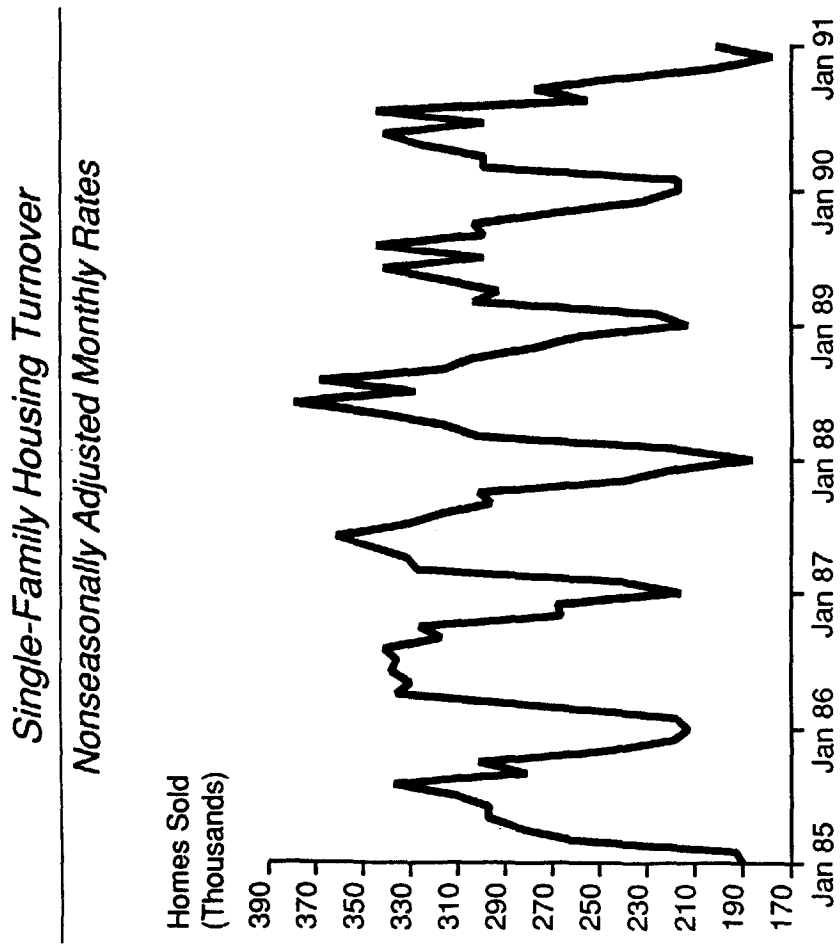

Single-Family Housing Turnover
Nonseasonally Adjusted Monthly Rates
Homes Sold
(Thousands)
390
370
350
330
310
290
270
250
230
210
190
170
Jan 85
Jan 86
Jan 87
Jan 88
Jan 89
Jan 90
Jan 91

CHART 9

HISTORICAL TEST OF PREPAYMENT MODEL
Issue: FNMA 30-Year 10.00%
January 1986-November 1990

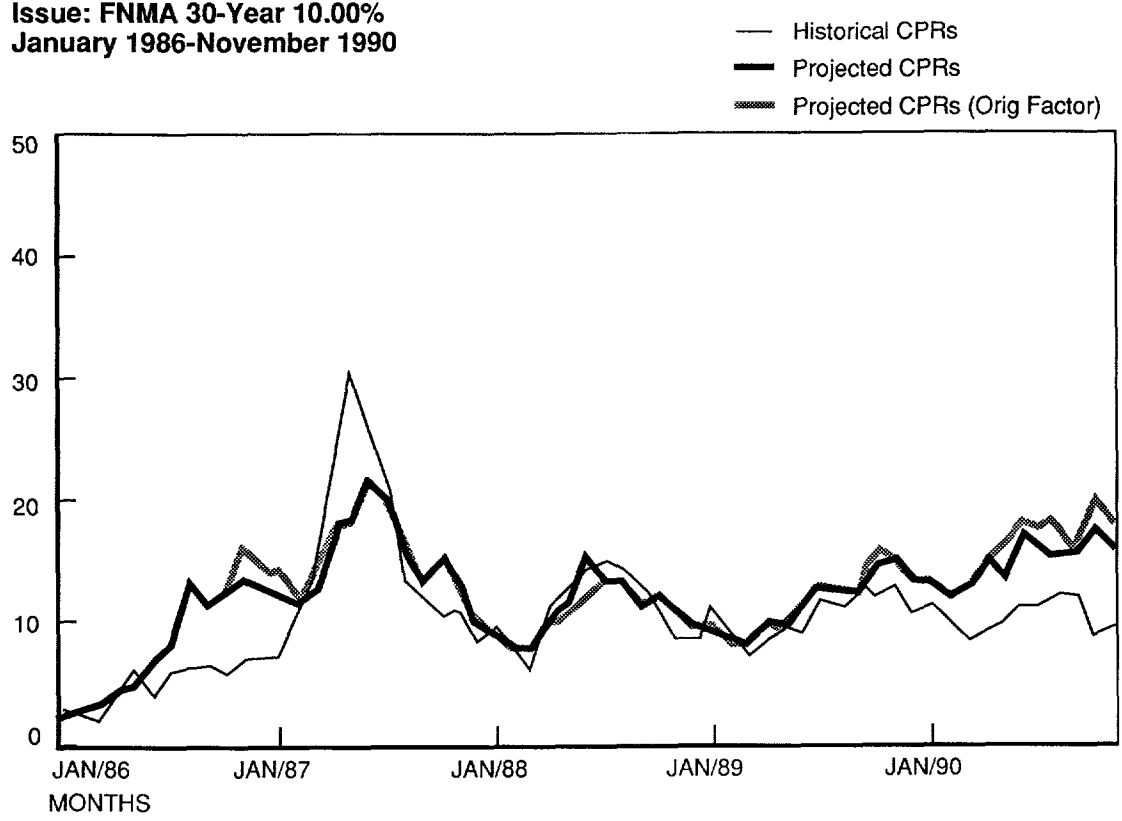
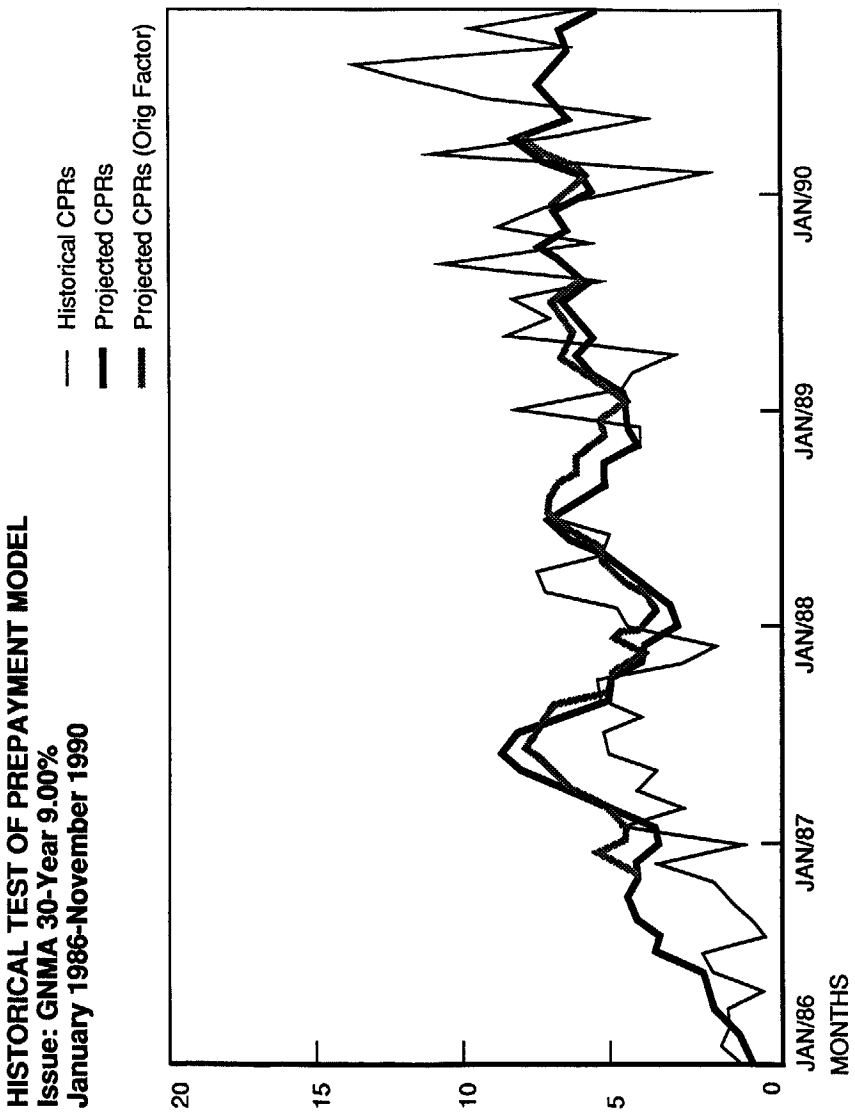


CHART 10


HISTORICAL TEST OF PREPAYMENT MODEL
Issue: GNMA 30-Year 9.00%
January 1986-November 1990
Historical CPRs
Projected CPRs
Projected CPRs (Orig Factor)
20
15
10
5
0
JAN/86
JAN/87
JAN/88
JAN/89
JAN/90
MONTHS

interest sensitive because credit card rates have not really moved a whole lot – they tend to have more of a relationship to the economy in general.

The credit card loans are composed of investor certificates and seller interest. Investor certificates are what you're buying, and the seller interest is a funding vehicle to keep the collateral and the investor certificates at the appropriate level. These are usually rated Triple A, through either a Letter of Credit or a Senior Subordinated Structure. Auto loans usually have a monthly amortization with a five- to seven-year final maturity. They are normally Triple A or Double A rated through either a Letter of Credit or Senior Subordinated Structure. They have a much lower interest rate sensitivity than home mortgages. Partially this is because a new car loan, when refinanced, becomes a used car loan, and used car loans have higher rates. The mechanics of car loans keep the interest sensitivity down. Cash flow risk, as well as defaults, actually tends to be related more to seasoning than rate. The longer the loan has been outstanding, the more equity that's built up in the automobile, and therefore the lower the default risk and the more the prepayments are assumed to be.

Now we'll get into CBOs. The underlying collateral is typically a diversified portfolio of high-yield bonds. Rating agencies require proper diversification and quality standards. It has to be well diversified in many respects (number of issues, industries, maturities). Typically they're issued in three classes: senior notes -- usually rated A or better; subordinated notes -- usually unrated; and the equity residual piece. The cash flow risk is clearly defaults. There is some interest sensitivity because many of the high-yield bonds are callable bonds. But (especially given where the high-yield market is today), the call risk poses very little cash flow risk. What you have is more a default risk. How much will default, and what are the ramifications on reinvestment rates?

A typical structure for a CBO is 70% issued as Senior Notes, 25% Subordinated Notes, and 5% equity. This structure achieves a 140% overcollateralization for the Senior Notes, making them a fairly secure piece. You end up with Senior Notes, which have (1) first claim on the cash flow, (2) highest claim on the collateral pool, (3) high quality credit, and (4) insulation from defaults, except in extreme cases, by junior tranches. They can also be insured, if needed, by a financial guarantor to raise the rate higher.

Subordinated pieces are the junior claim on the cash flow and the junior claim on the collateral pool and are therefore considered risky debt. You bear, if not the first risk of loss, certainly a substantial risk of loss.

The equity is an economic residual. It is junior to both the Senior and Subordinate, and absorbs the first losses. It is very high risk but, if the underlying issues do well, it has a very high return. The equity can be structured as common, preferred, or junior subordinated debt, whichever accommodates the needs of the buyer.

MR. WALTER C. BARNES*: Have you seen any of those traded yet? What does the senior piece trade at over Treasuries?

* Mr. Barnes, not a member of the sponsoring organizations, is Assistant Vice President of Travelers Realty Investment Company in Hartford, Connecticut.

MR. WOOLFORD: The first ones came out at 180 on the private placement market, and went as wide as 230. Today you couldn't get them done.

MR. BARNES: What is the average maturity -- 10 years?

MR. WOOLFORD: No, these would be shorter at six to seven years on average.

MR. BARNES: Is that the senior piece?

MR. MINTON: That's right.

MR. WOOLFORD: Today you couldn't get a senior piece done inside of 250.

MR. BARNES: What about the junior piece?

MR. WOOLFORD: I don't know if you'd find a buyer. Some insurers are looking at the idea of doing cosmetic surgery on their NAIC three through six obligations by taking a pool of NAIC three through six and making a two and a five.

MR. BARNES: Is that "good bank, bad bank"?

MR. WOOLFORD: Yes -- It's totally cosmetic. You haven't changed the economics of the risk on the balance sheet at all.

MR. PERREAULT: I think Dave should finish his presentation now. We'll take questions at the end.

MR. WOOLFORD: At times, Wall Street has tried for a home run by selling something at a price far above its intrinsic value. Take the example of Donaldson, Lufkin & Jenrette's (DLJs) Bull/Bear structure, offered in October 1989. This security offered investors a play on DLJs high-yield index, although that, as we'll see, was ancillary. At the time, DLJ had constructed a high-yield index consisting of 22 bonds -- no payments in kind, zeroes, extendables or resets -- that would be priced on the bid side of the market each Friday. That October, the index was trading about 680 basis points over the seven-year Treasury, or a "yield" to maturity of about 14.7%.

The proposed CMO had three tranches: a "Bull," a "Bear," and a residual, retained by DLJ. Principal payments were to be shared prorata based on the initial bull, bear, and residual par amounts.

The bear offered a coupon that reset monthly, paid monthly, and had an amortizing principal based on AAA collateral. The initial coupon was set at 12.75% and was reset each month according to the following formula based on the yield (to worst) of the DLJ high yield index:

$$\text{Bear} = 12.75\% \times \text{DLJ index} - 187.425; \text{ minimum } 0.$$

The maximum coupon -- with the yield on the high yield index at 200 basis points above the initial level of 14.7% -- was 25.5%.

The bull offered the opposite play: higher returns if the index fell in yield, according to the following formula:

$$\text{Bull} = -6.375\% \times \text{DLJ Index} + 106.4625; \text{ maximum } 12.75\%$$

This structure is a variant on an inverse floater, because the high coupon on the first security is supported by a low coupon on the second, and conversely.

Let's see how this security can be constructed in the CMO world.

Table 3 shows coupons that result from various weights of Bull and Bear. That's important because DLJ doesn't know what the relative demand for Bulls versus Bears will be, and wants to make sure that it doesn't care. The combined coupon is invariant to the index yield, given the inverse floater formulation proposed by DLJ for the "bull" security.

TABLE 3
Donaldson, Lufkin & Jenrette
Bull/Bear Bond Structure

Index Yield	Bull Weight	Bear Weight	Combined Coupon
14.70%	80.00%	20.00%	10.20%
14.70	70.00	30.00	8.93
14.70	65.00	35.00	8.93
14.70	60.00	40.00	7.65
14.70	55.00	45.00	7.01
14.70	50.00	50.00	6.38
14.70	45.00	55.00	5.74
14.70	40.00	60.00	5.10
14.70	30.00	70.00	3.83
14.70	20.00	80.00	2.55

For example, a 66% Bull/33% Bear weighing produces an 8.5% coupon. However, participation certificate (PC) 8.5s were selling at the time for just under a $96 price, implying that the DLJ creation would produce a four-point takeout to DLJ. DLJs formulation would be readily supportable up to about a 70/30 bull/bear relationship.

For higher "Bear" proportions, DLJ would have to vary the terms of the deal -- by reducing the initial coupon on the bear tranche. This would be easily justified if the bear tranche were oversubscribed.

Fortunately for our confidence in buy side analysis, the security couldn't find a ready book.

Certificates of beneficial obligation -- CBOs -- which Peter has discussed in more detail, whether backed by sold or soon-to-be-sold automobiles (the latter are called receivables), by timeshares, by high-yield securities, by home equity loans, by reinsurance contracts, by policyholder loans, by timber properties or by credit cards -- the possibilities really *are* limitless -- all have a couple of common features:

- The issuer finds that his present leverage and borrowing perception in the marketplace deem that he seeks nonrecourse financing, and

- The marketplace has a weak understanding of the quality of the loans underlying the certificates but is willing to place a high probability on the ability of the seller/servicer to construct a diversified pool that will result in actuarially smooth defaults (not Armageddon), so that the credit enhancement will not be exhausted prematurely.

The first feature is sufficient but not necessary: a carefully crafted tax strategy can also be behind a financing. The market is skeptical of an actuarially smooth result, so the yield pattern for the CBO with a smooth pattern for the collateral will look attractive.

What does this mean? Let me try to explain using Table 4, which shows the effect of a constant default rate on a portfolio of "high-yield" securities currently yielding 15%. The portfolio "pays" monthly to a 10-year final maturity and has a smooth flow of principal in the absence of calls or defaults – similar to the scheduled payments for a mortgage. Defaults average a steady 8% of the remaining balance; recoveries are always 40%.

TABLE 4
Security: $100 million
15% WAC
10 year final monthly amortization
40% recovery on defaults

Default Pattern	Cumulative Default	Cumulative Loss of Principal	Price to Yield 15%	Cash Flow Yield @ Par Price
level at 8% annually (base case)	8.3%	23%	86.883	10.2%
100% 400% of base 25% 100%	12.3	31%	79.582	6.8
100% 25% of base 400% 100%	12.3	29%	82.433	8.1

All this looks attractive, but remember, these are all highly leveraged companies. Defaults won't be uncorrelated. What happens with a more volatile default pattern?

I imposed a cycle of defaults that in the first instance rose to quadruple their "normal" rate in the second year, fell back to 25% of normal in the third, then were normal for the next two years, etc. In the second instance, the process is identical except to

reverse the experience of the second and third, sixth and seventh, and tenth years, so that in the first year of the pairing, defaults shrink to 25% of normal, but accelerate to 400% in the next year. Whether defaults initially increase or decrease, the volatility of the process creates need for additional capital (a C-3 addition to C-1, if you will) that raises the hurdle to "play" in this market.

Does securitization change this conclusion?

Only in degree. The junior/senior structures predominate in the marketplace – sometimes with mezzanine layers to provide further credit and/or cash flow protection for the senior tranche – they are limited in their ability to provide "insurance" by the market's pricing of the underlying collateral. Since securitization bids up the price of the underlying collateral, the attainable amount of protection must be reduced.

The only reason that you would find the senior layer more attractive than the collateral is that you believe that your risk tolerance is less than that of the market.

For my final example, let's look briefly at the securitized market with manufactured housing as collateral. These securities combine features of CMOs and CBOs.

Chart 11 is from a recent Merrill Lynch research publication. Manufactured homes, like most consumer durables, depreciate as they age. The mortgage also amortizes, but amortization is the mirror image of the depreciation schedule. The result is a region between years two and five where the collateral is worth less than the outstanding mortgage.

What do you suppose that this does to the incentive to default?

One determinant of default is the due diligence by the servicer – also frequently the pooler and possibly the originator.

Table 5, from a recent Willamette whole loan offering for manufactured housing, suggests how default experience can vary within a sample of competent servicers.

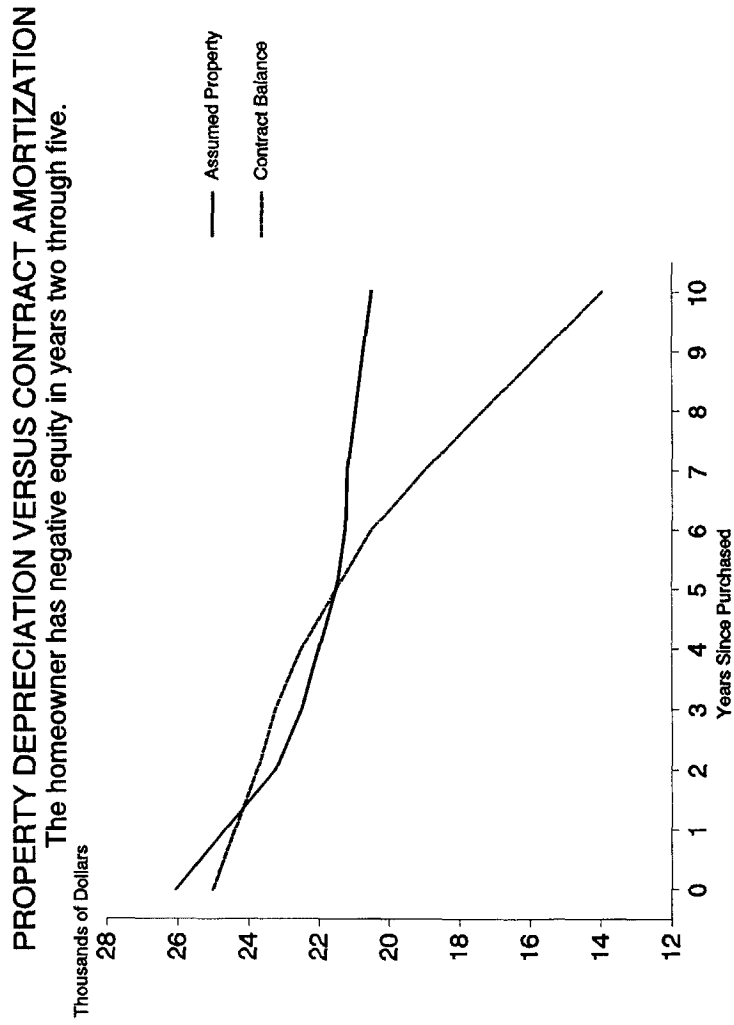
TABLE 5
Willamette Savings Mobile Home Default/Loss Comparables

Security	Servicer/Underwriter	Annual Default Rate*	Loss Severity
MLMI88Q	Green Tree	3.9%	37%
MLMI88X	Green Tree	3.7	31
MLMI88J	Security Pacific	4.3	63
MLMI88P	Security Pacific	3.9	46
MLMI88R	Western Savings	8.0	73
MLMI88U	Western Savings	7.4	74

* Last 12 months

Now: here's your choice. A senior/subordinated issue by Merrill Lynch, 22% subordination, priced at par to yield 10.25 assuming a 6% default rate and a 240%

CHART 11


PROPERTY DEPRECIATION VERSUS CONTRACT AMORTIZATION
The homeowner has negative equity in years two through five.
Thousands of Dollars
28
26
24
22
20
18
16
14
12
Assumed Property
Contract Balance
0 1 2 3 4 5 6 7 8 9 10
Years Since Purchased

PSA, or First Boston's whole loan package, no subordination, 12.064% coupon, 33% Texas, priced at an $85.6 price. You make the call.

Insurance companies have traditionally been considered among the principal sources of long-term capital because the participating nature of much of their liabilities gives them the ability to take the "long view." The traditional view has been that insurers are (relatively) more efficient investors in debt instruments, while pension funds are relatively more efficient investors in equity. As defined benefit programs become more mature, and portable or defined contribution plans proliferate, this conclusion becomes more open to question. However, at least at The Prudential, and I would assume at other institutions, there is a clear policy not to invest in failing companies or substandard investments. That would rule out buying a senior security with limited insulation from credit deterioration if the underlying instrument was seen as marginal. The analogy would be purchase of a senior security in a weak company: we simply wouldn't make the investment unless our credit review led us to conclude that we were prepared to support the company.

I conclude that securitized instruments should be purchased because of their intrinsic ability to cover a liability, but the insurer's due diligence must extend to the collateral -- and consistency demands that the collateral be viewed as an acceptable investment at its current market price if the securitized instrument is viewed as attractive.

This discussion suggests a different view of securitized investments.

1. Securitized transactions cannot be a more attractive credit than the underlying collateral.

2. Securitized transactions cannot be cheaper than the underlying collateral.

3. Analyzing and measuring the performance of a securitized transaction requires as much or more skill than the analysis required to purchase or sell the underlying collateral.

If you accept these three statements, then the sophisticated response will be to create securitized transactions internally.

How difficult is this?

Like the cost of computing, the cost of analyzing securitized transactions has been decreasing. Last summer, some acquaintances of mine formed a mortgage derivatives and securitized transactions group at Fuji. One of them noted that the same analytical talent that had been required to create a sophisticated cash flow generator to optimize CMO structures at a cost approaching $5 million is now widely available virtually off-the-shelf at a fraction of the cost -- and the sophisticated workstations and mainframes to run these analyses are also widely available in a Remote Information Systems Center (RISC) workstation.

Rather than pore over new Wall Street creations, however, you can apply the same analysis to creating securities from collateral that better mimic your business mix.

For example, suppose that your businesses have the following makeup: 50% traditional whole life, 20% group health, 25% savings protector guarantees, and 5% reinsurance.

The analysis might indicate that traditional whole life and, to a lesser extent, reinsurance, could support the cash flow volatility of mortgage securities. It might suggest using PAC and floater CMOs for Guaranteed products and Group Health – the latter because of frequent repricing of the crediting rate.

Separately, portfolios are likely to end up holding a variety of derivatives and securitized instruments. The business unit actuaries compete for higher yields on their product lines to support competitive crediting rates but also to argue for additional capital to support expansion. However, an internal analysis that reflects all parties' cash flow requirements, including crediting rates, can result in a more optimal solution by including internal CMOs.

An internal CMO might look like the following: PAC PO tranche for the guaranteed product area; floater, IO, and short WAM tranches for Group Life; long WAM and higher-yielding support tranche paper -- possibly even a jump Z -- for the individual area; and high-yield support tranche for reinsurance. For this to be a realistic solution, several conditions must be met:

1. Liquidity: An actively managed MBS portfolio should outperform an unmanaged benchmark by 30-75 basis points. This involves trading the collateral to Treasuries or different coupons or collateral of various seasoning. The internal CMO will prevent this activity unless there is agreement in advance as to how to share gains and losses in the tranches. Generally, this involves a mark-to-market versus the original synthetic at regular intervals; at each of these points, a new synthetic and a new sharing can replace the old.

2. Accountability: It's hard to remember the "old" days at some companies when there was one large General Account for policyholders. There still is, but the accounting for product profitability may defeat initiatives that cross business or product boundaries. We've had most success in notionally using these techniques within a profit center.

3. Accounting: Similar to accountability. Remember, however, that accounting for an internally securitized transaction has one advantage -- and one disadvantage -- over a real portfolio of CMOs. The one advantage is that the internal accounting is just that: internal. The disadvantage is that the trustee's cash flow notifications and audit checks are replaced by this internal system.

To conclude:

1. Like any other custom-tailored product, securitization carries a packaging cost. Be sure that you've estimated that cost and are prepared to bear it.

2. If you have the necessary analytics to analyze these securities independently, why not manufacture them internally? If you don't have the analytics, are you sure that you're getting a complete report on performance?

3. Preparation of accurate returns is costly. Be prepared to pay an appropriate price and –

4. Good Luck!

FROM THE FLOOR: You say you're using this between divisions, basically splitting up some of the cash flows of the existing assets. Do you have to do that with any of the lines that you do valuation opinions on? And if you do, how do you handle those assets?

MR. WOOLFORD: We have not yet done this successfully across profitability lines – we're doing it where we can have a single valuation. But there's nothing at this point that would prevent us from doing that, given our internal systems. You can take a CMO that you created the previous month, and you can effectively mark that CMO to market. You're going to have to do that anyway if you own CMOs and are thinking about doing total return comparisons. At that point you can, if you want, effectively retrade that CMO internally. You can restructure it to reflect what the new desires of the product lines are. You do, however, have to follow those cash flows carefully to be sure that you have an audit trail on what your internal marks to market were. And if I understand what you were asking me, the other issue becomes are you treating participating and nonparticipating cases in the same way? I don't think we've had any problem in addressing that issue at this point.

FROM THE FLOOR: I'd like to ask about credit card PACs. Is there anything like a PSA rate equivalent for those to model a cash flow?

MR. MINTON: In these instruments it's called Absolute Prepayment Rate (ABS). In general, they are viewed to be relatively stable and are usually about 1.3%. One thing to note on that versus CPRs or PSAs. In CPRs and PSAs, you are applying those percentages to the remaining principal balance whereas in credit cards you are applying it to the original value of the instrument. So it's a bit of apples and oranges.

MR. WOOLFORD: In a typical mortgage, you've got very slow prepayments in the first couple of years of its life. Then, depending on economic conditions, it will either flare up and burn off or, if interest rates go very high, stay relatively low. If you're dealing with auto loans, prepayments will be high for the first six months. That may relate to you crashing the Corvette just after you got it out of the showroom, and it may also relate to the fact that you found you couldn't make the payments on that Porsche. Then they drop very sharply and level off again. I don't know that anyone really has a good understanding of why that is.

Credit cards are a little different. What you've got is a big pool of credit card receivables. And, for reasons that defeat economic rationality to some extent, a lot of people don't pay off their credit card balances. There is some migration in and out of these pools. On average you would expect a static pool to fully pay off a loan that has 15% subordination in about eight months. If you started off with $115 million, enough people pay off their credit card balances so that pool will be gone in eight months. So what you do is start off with a pool and add new people that have consistent bases with the existing pool, to keep the credit card pool topped off.

It's not a static pool in the sense of a static pool from a mortgage or an auto loan sense. It's a changing pool in which your credit card portfolio has certain characteristics that you've established. Those characteristics relate to seasoning, income, and credit card balances, among others. There isn't a standard statement in credit cards that I can make. ABS would be very high in this case, because it just takes eight months for the pool to run off.

FROM THE FLOOR: So it really helps to get an idea of what the cash flow is going to look like. Do they give us weighted average life of around four years?

MR. WOOLFORD: You can make a credit card transaction have any average life you want. You ensure that by saying that you're willing to have the pool topped off repeatedly over time. The reason that they've typically not gone past three to four years is that finding new people with the same characteristics as the people leaving becomes progressively more difficult. If you're willing to make some re-evaluation of pool characteristics, you can have that credit card be an evergreen type of transaction. But the actual speed with which those cards get paid off, once you leave that pool static, is very rapid.

MR. MINTON: It is a replenishing of the collateral back from the seller that keeps the ABS at a level slower than an eight-month prepayment. Partially the answer depends on the particulars of the issue that you're looking at and how it's going to be replenished. The real answer is it's a tough one to estimate and you just have to really look at them carefully to see if you're being given a reasonable answer.

MR. WOOLFORD: We know that, for a new issue piece of plastic, done on a direct mail program, default will not occur immediately on a large number of cards. But you will experience relatively high defaults over the next 18 months to two years for the most part. Maryland National Bank introduced affinity cards, where an organization has a credit card with its logo on it. If you pick the right groups, those prove to have quite a bit lower default rates than the normal card. The other card that's in demand these days comes out of Texas. If you can find Texan credit cardholders who kept paying their cards through their trying times, you have a select group that probably will continue to make their payments.